Historic, archived document

Do not assume content reflects current scientific knowledge, policies, or practices.

CIRCULAR No. 384 March 1936
UNITED STATES DEPARTMENT OF AGRICULTURE
WASHINGTON, D. C.

MAKING AND USING PEANUT BUTTER[1]

By W. R. Beattie, *senior horticulturist, Division of Fruit and Vegetable Crops and Diseases, Bureau of Plant Industry*

CONTENTS

Page
Development of the peanut-butter industry 1
Commercial manufacture of peanut butter 1
  The stock 2
  Factory and equipment 2
  Roasting 3
  Blanching 5
  Hand-picking 6
Commercial manufacture of peanut butter—Continued.
  Blending 7
  Grinding 7
  Bottling and packing 8
Home manufacture of peanut butter 10
Food value and ways of using peanut butter 11

DEVELOPMENT OF THE PEANUT-BUTTER INDUSTRY

The commercial production of peanut butter has developed to large proportions in recent years. In the early days of its manufacture peanut butter was made in sanitariums and used largely as a food for invalids, but its fine qualities and food value were soon appreciated, and it outgrew this limited use. At first peanut butter was manufactured in a small way by individuals and sold from house to house; then small factories sprang up, and peanut butter became an article on the grocers' shelves. Today there are a number of large and small factories turning out peanut butter and other peanut products in great volume, and in addition to being considered an important luncheon delicacy it has become a standard article of food and is used in the preparation of various food combinations. Peanut butter of fair quality may be made in the home by the use of an ordinary cookstove oven for the roasting and a meat grinder for grinding the roasted peanuts. The quantity of peanuts now used annually in the manufacture of peanut butter is approximately 200,000,000 pounds of farmers' goods. More peanuts now go into peanut butter than any other one use.

COMMERCIAL MANUFACTURE OF PEANUT BUTTER

In the manufacture of peanut butter only the best materials should be used. High-grade butter cannot be made from inferior nuts. On the other hand, the best stock will not make good butter unless all the work of converting it into a high-grade product is carried on in the proper way and under sanitary conditions.

---

[1] This circular supersedes the following publications:
Beattie, W. R. Peanut Butter. U. S. Dept. Agr., Bur. Plant Indus. Circ. 98; 14 pp., illus.
Thompson, H. C. The Manufacture and Use of Peanut Butter. U. S. Dept. Agr. Dept. Circ. 128, 16 pp., illus.
The section on Food Value and Ways of Using Peanut Butter, beginning on p. 11, was prepared by the Bureau of Home Economics.

THE STOCK

Most peanut-butter manufacturers obtain their peanuts from cleaning and shelling factories, where they have already undergone the cleaning, shelling, and grading processes. This is generally considered the better method, although a few manufacturers prefer to buy farmers'-stock peanuts and do their own cleaning and shelling as a matter of economy. In that case the cleaning and shelling should be done in a separate building, to prevent the dirt incident to the cleaning from getting into the butter.

The varieties of peanuts most commonly used in the manufacture of peanut butter are the Jumbo, Virginia Bunch, Virginia Runner, and Spanish. A few factories use the Virginia varieties alone, while the majority use a mixture of Jumbo, Virginia Runner or Virginia Bunch, and Spanish. It is thought by some that the Virginia varieties do not contain enough oil, while the Spanish peanuts contain too much. For this reason a mixture of the two types is used.

As the peanuts come from the farms they have mixed with them considerable dirt and trash, which must be removed before they are ready for the market. After being cleaned, the shelling stock of the large-podded varieties of the Virginia type is separated from that to be sold in the shell. Peanuts of this type always include a small percentage of pods that have been damaged or discolored in the field. These, together with the pods that become broken in handling, are used for shelling. The greater part of the Spanish and Southeastern Runner varieties is shelled, since these varieties are not so popular as roasted peanuts.

Three grades of shelled peanuts are produced in the shelling factory: No. 1, which consists of the perfect, unbroken kernels; the No. 2, of split and slightly broken kernels; and the No. 3, consisting of finely broken kernels, the shriveled or immature peas known as "pegs", also the germs or hearts that have been separated from the broken kernels. Only the No. 1 and occasionally the best of the No. 2 grade of shelled peanuts are used for the making of peanut butter. The third grade makes a very inferior product which is unfit for human consumption. Both the peanut-butter and the peanut-candy industries have suffered in the past from the fact that the manufacturers have used so many shelled No. 2 peanuts in their products.

FACTORY AND EQUIPMENT

In selecting a location for a peanut-butter factory the transportation facilities, labor supply, and proximity to the raw material and to consuming centers should be considered. The factory building should be located near a railroad, so that a spur track or siding can be used for loading and unloading materials and supplies without having to haul them on wagons or trucks. The labor supply requires special attention, as usually most of the workers in a peanut-butter factory are women rather than men.

It is not necessary that the factory be located in a peanut-growing region, although such a location has some advantages. It is probably more important that it should be near the principal consuming centers, which are nearer the sources of supply of equipment, fuel, and accessories such as bottles and jars. A factory located near a large consuming center has a longer haul for the raw product but a shorter haul for a large part of the finished article than the factory in the peanut-producing region.

The model peanut-butter factory consists of a 4- or 5-story building equipped and arranged for convenience and economy in handling the materials. The building should be light and airy and should be especially designed for good sanitation. Some factories have all the equipment on one floor, but this necessitates considerable trucking back and forth, or the use of conveyors, as a gravity system cannot be used in delivering the goods from one machine to another.

The equipment of a peanut-butter factory consists of roasters, blanchers, picking tables, grinders, bottle-filling, capping, and labeling machines, and the power necessary to run the machinery, together with elevator, chutes, and suitable facilities for storing, packing, and shipping the raw material and the finished product.

Probably the ideal arrangement in a 4-story building is to have the roasting machinery and the stock of raw peanuts on the top floor; the blanching machinery and picking tables on the third floor; the grinders, bottling machines, and capping machines on the second floor; and the storage, packing, and shipping departments on the first floor. In this arrangement the materials come from the top floor to the bottom floor by gravity with the minimum of hand work required in carrying them from one machine to the other.

As most peanut-butter manufacturers secure shelled goods from cleaning and shelling factories, the cleaning and shelling processes will not be discussed here.

ROASTING

In the manufacture of peanut butter from shelled nuts the roasting is the first operation, and in an ideal factory this is done on the top floor. The roasting machinery is made especially for the purpose, but is similar to that used in coffee roasting. Figure 1 shows a battery of roasters and cooling equipment. In some factories the peanuts are elevated to a hopper over the roaster and are fed by gravity through a chute into the end of the roasting drum.

After the roasting is completed the peanuts are dumped from the drum into a hopper with perforated bottom and sides. This hopper is built on a truck which can be moved up to the roaster to receive the nuts and then moved back for the cooling. The cooling is accomplished by drawing currents of air through the peanuts and through the side or bottom of the hopper by means of a suction fan.

In some factories natural gas is used for fuel, while in others artificial gas, coal, or coke is employed. The temperature is more easily controlled where gas is used. The length of time required for roasting peanuts varies with the temperature and the class of goods used. When the peanuts are fresh, early in the season, the roasting process requires a longer time than when the peanuts have become thoroughly dried.

The temperature should not be high enough to scorch the peanuts. About 320° F. is considered right for shelled nuts, and at this temperature 40 minutes to an hour is required to roast a batch. However, the state of roasting must be determined by the judgment and experience of the operator. As a rule, peanuts for butter are not subjected to so heavy a roast as is required for salted peanuts or peanuts roasted in the shell. If the roasting process is carried too

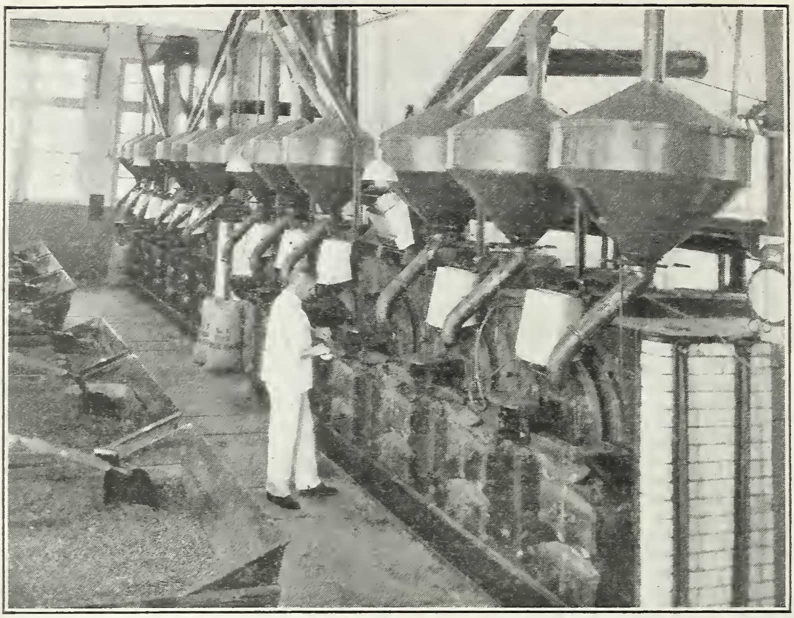

FIGURE 1.—Typical roasting and cooling equipment in a well-arranged peanut-butter factory.

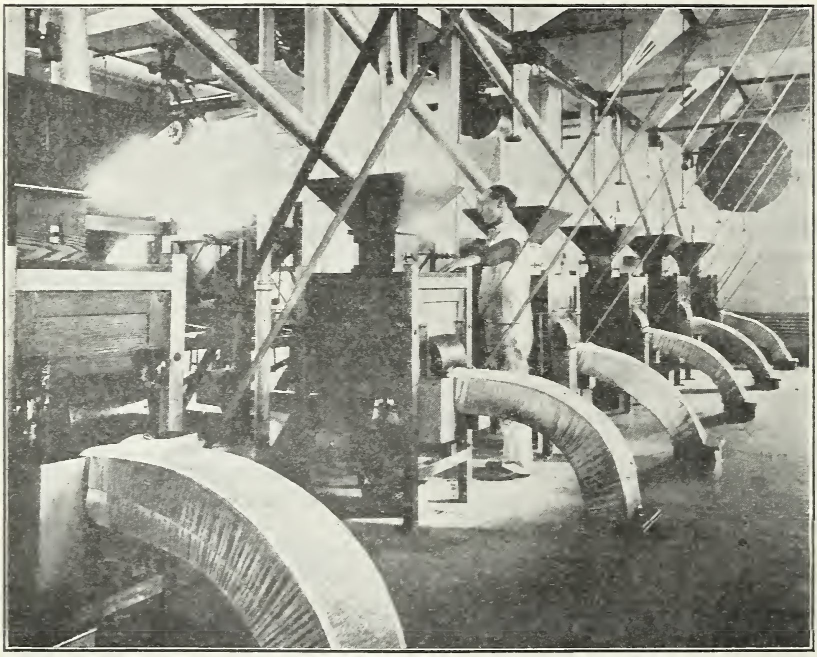

FIGURE 2.—A type of blanching machine used in some peanut-butter factories. These machines remove the skins and loosen most of the germs.

far the butter has a dark-brown color and a burned taste. Peanuts that have had a mild roast are considered more palatable and more wholesome than those that have been overroasted. On the other hand, underroasted nuts make a butter that lacks flavor and color, and does not keep so well as that made from properly roasted peanuts.

BLANCHING

After the peanuts have been roasted and cooled they are ready to be blanched. In modern factories they are dumped from the cooling hoppers into chutes from which they are fed into the blanching machines.

The blanching consists of removing the skins, or seed coats, and is accomplished by machines made especially for this purpose (fig. 2). These machines have brushes which revolve against a corrugated plate. The blanching splits most of the peas into halves and loosens the germ or "hearts." After passing between the corrugated plate and the brushes, the meats pass over a screen and in front of a fan. The fan blows out the skins and some of the fine particles of meal, while the germs fall through the holes in the wire screen.

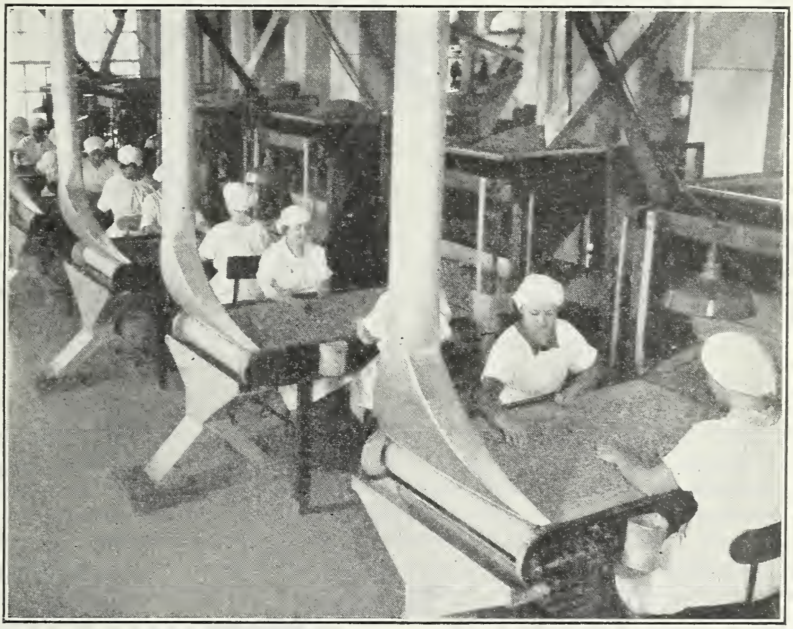

FIGURE 3.—Picking tables used in a peanut-butter factory. The peanuts, after being roasted and blanched, pass over these tables, and women remove foreign particles and all unblanched and discolored pieces of nut.

In order to get high-grade butter it is necessary to remove the skins and all of the germs. The skins show in the butter as dark specks and give it a slightly bitter taste. The germs give the butter a bitter taste and cause it to turn rancid sooner than when they are not present. The germs and skins are sold as feed or to oil mills which press out the oil and dispose of the resulting cake or meal for stock feed.

HAND-PICKING

No matter how carefully the cleaning and grading are done in the cleaning and shelling factory, some hand-picking is necessary in the peanut-butter factory. The blanched meats usually pass from the blanching machines to the picking tables, alongside of which are seated women who pick out any unblanched or discolored nuts and any foreign matter present. In one factory the blanched meats pass over a screen at the end of the picking table in order that any germs that have been loosened after the material has left the blanching machine may be sifted out. After passing over these screens the meats move along on wide canvas belts, similar to those shown in figure 3. As the meats pass along, women pick out the material which would lower the quality of the butter or detract from its appearance. These women are sometimes paid on the basis of the number of pounds of material picked out.

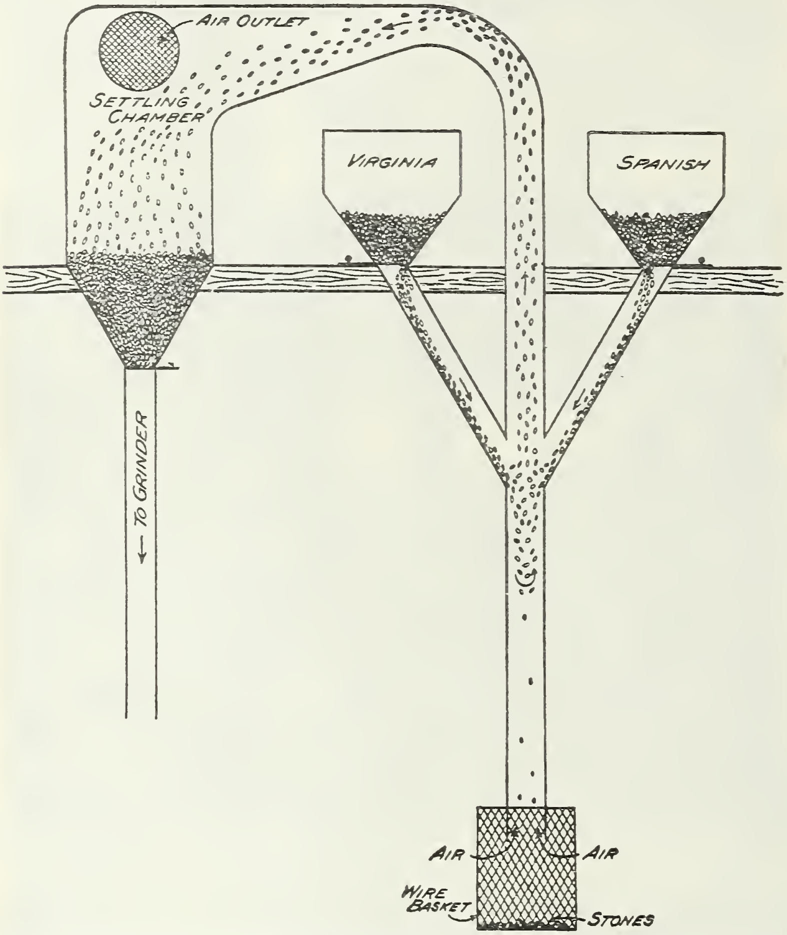

FIGURE 4.—Sketch showing a device known as a stoner boot used for removing stones and other heavy materials from the cleaned peanut meats.

From the picking tables the meats are drawn into chutes which carry them to hoppers over the grinding machinery.

In some factories a mechanical stoner is used to remove small pebbles or pieces of stone which were not removed in the sorting process in the cleaning factory and also escaped the hand pickers. The stoner works upon a gravity basis. The peanuts, being lighter than the stones, are drawn upward by a suction blast and the stones drop into a receptacle, as shown in figure 4. The removal of the stones is very important, as they injure the grinding machine and lower the quality of the butter. Consumers naturally object to peanut butter that is gritty.

BLENDING

When two grades or kinds of peanuts are used in making peanut butter they are usually blended as they are fed into the hopper above the grinder. In one factory the blending is done in the stoner, two streams being fed side by side and blended by an air blast, as illustrated in figure 4.

While some manufacturers use only one variety, others use a mixture of Virginia and Spanish peanuts. As a rule the blend is about 50–50, but in some cases a blend of 60 percent of the Jumbo or Virginia type and 40 percent of Spanish is used. The uniformity of the product where two varieties are used depends upon the completeness of the blend.

Virginia peanuts when used alone make a product lacking in smoothness unless very finely ground, but by the addition of Spanish stock the consistency is materially improved. The Spanish variety used alone makes a very smooth but rather too oily product. A better grade of peanut butter is produced by the proper blending of the Spanish with another variety having a lower oil content.

GRINDING

Commercial manufacture of peanut butter requires the use of special machinery for grinding the nuts. The butter should be brought to a fine granular form rather than a pasty consistency. When ground too fine the butter sticks to the roof of the mouth and when too coarse it has a gritty feel, which is objectionable. The aim in grinding peanut butter should be to break the oil cells apart rather than crush them. Worn or smooth grinding plates when run closely together do not give good results, because the rubbing of the butter between them makes a pasty product which allows the oil to settle out.

The grinding process produces considerable heat by the rubbing together of the plates, and great care is necessary to prevent heating the butter. Some grinders have the working parts surrounded by a water jacket. By circulating hot or cold water through this jacket the temperature can be controlled.

Large peanut-butter factories use large grinders, similar to the one shown in figure 5, run by a 30-horsepower motor, which will grind as much as 20 pounds of meats per minute. Small factories use machines similar to the one shown in figure 6 but of less capacity. While the small machines do not have so great a tendency to become overheated, care must be taken to run them at a moderate speed or to allow them to cool occasionally.

Before the peanut meats are ground a small quantity of high-grade dairy salt is usually added. The proportion of salt varies from 1½ to 3 percent by weight. Sometimes the salt is mixed with the peanuts before they reach the hopper of the grinder, but some grinding machines are fitted with a small auxiliary hopper from which the salt is fed into the machine with the peanuts by means of a worm or screw. It is very important to have the salt uniformly distributed through the butter.

Some manufacturers if requested will supply peanut butter without salt or with only a small amount, as many persons prefer it with little or no salt.

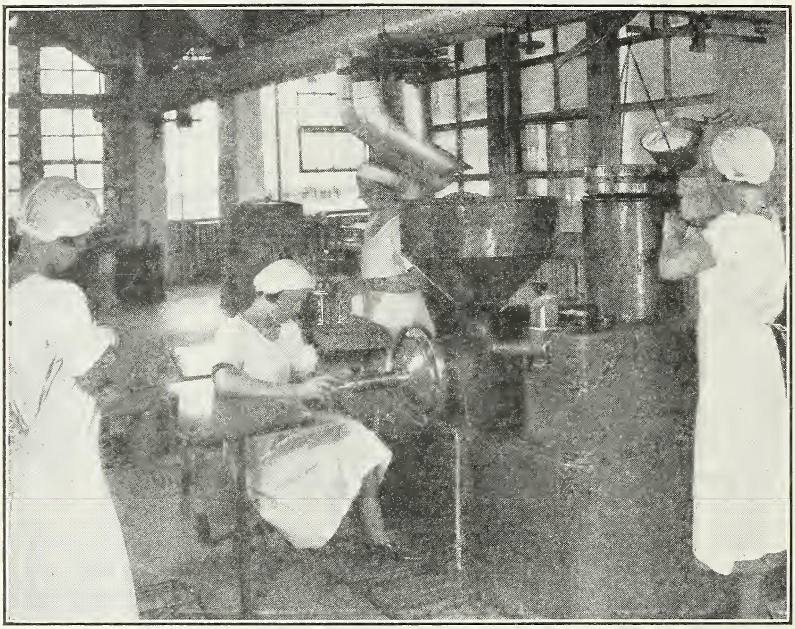

FIGURE 5.—A section of a peanut-butter factory, showing a grinding and bottling machine. Hopper containing salt on right of machine.

BOTTLING AND PACKING

Peanut butter is sold in glass bottles, glass jars, tin cans, pails, tubs, and barrels. Most of the retail trade is supplied with butter in bottles or in small glass jars.

The bottles or other containers are often filled directly from the spout of the grinder, as shown in figure 5, but sometimes from a separate filling machine. The butter should be transferred from the grinder to a filling machine by means of a closed conveyor rather than by means of open tubs or pails. If it is necessary to use tubs or pails they should be kept covered, so as to keep out particles of dust and dirt that may be in the air. Another method is to have the grinding machines on a raised platform, discharging directly into the filling machine. The only advantage in using a filling machine is to get the butter more thoroughly mixed, but that is not necessary with up-to-date grinders, especially when these are equipped with the auxiliary hopper for the salt. Whether filled from the grinder or from the filling machine, the container should be filled directly from the spout, the operator holding the container against the spout with sufficient pressure to prevent the formation of air bubbles.

As the filled containers come from the grinding and filling machine they should go direct to the capping and sealing machine, where they are sealed under vacuum. Formerly the sealing was done in a vacuum chamber, but in the most modern factories the air is exhausted and the lids applied in a continuous-working sealing machine, as shown in the background of figure 7. Jars having rubber gaskets are not satisfactory, as the oil of the peanut butter softens the rubber. Paper gaskets and airtight friction lids are now used almost exclusively.

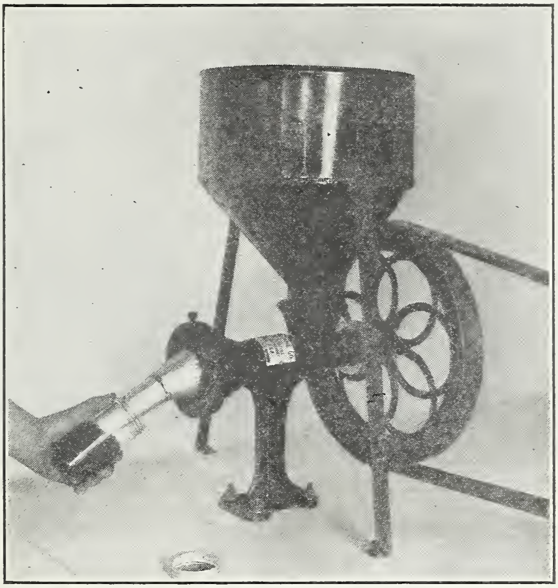

FIGURE 6.—A small peanut-butter grinder.

When pails or tubs are used for packing peanut butter they are provided with wood or metal covers held in place with wire, strips of metal, or nails, no attempt being made to make them airtight. Large containers are not satisfactory for peanut butter except for establishments using large quantities of the product. For the individual consumer or for the small family small containers are more satisfactory, because the butter can be used before it deteriorates. The principal objection to the sale of bulk peanut butter is the fact that the containers are frequently left uncovered in the stores and the contents exposed to dust, dirt, and insects. Unless the butter is sold within a short time after opening it may become rancid.

The bottles or glass jars containing peanut butter are usually packed in pasteboard cartons holding 1, 2, or 3 dozen. The jars used should be clear white, as glass of a greenish tint will give the best peanut butter an inferior appearance.

Dealers handling peanut butter in bulk should bear in mind that the oil has a tendency to rise to the top. In order to have a uniform product it is desirable to stir the butter frequently with a wooden paddle. Consumers often complain that oil rises to the top of peanut butter in glass jars. When this happens it is only necessary to mix the oil thoroughly with the remainder of the contents by stirring with a spoon or knife.

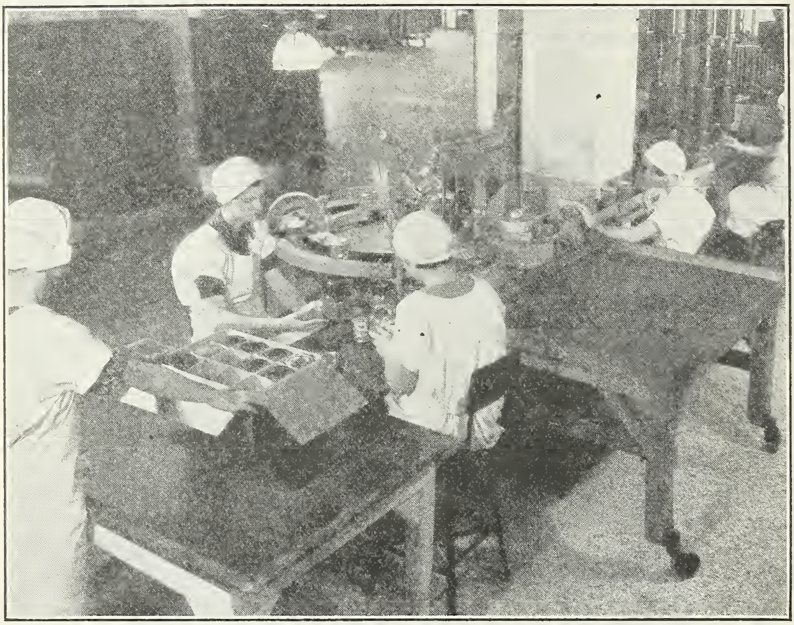

FIGURE 7.—Vacuum capping and sealing machine in background. Jar-labeling machine in foreground.

HOME MANUFACTURE OF PEANUT BUTTER

From what has been said about the commercial manufacture of peanut butter it is evident that the process is very simple. Usually nothing is taken from the peanuts except the germs and skins, and nothing is added except a small quantity of salt. Many persons have the idea that peanut butter consists of ground peanuts mixed with oil. As shelled peanuts contain from 13 to 50 percent of oil, depending on the variety, it is unnecessary to add oil. The only difference between ground peanuts and peanut butter is in the fineness of the particles.

A cheap, wholesome peanut butter can be made at home by means of an ordinary meat grinder. Raw unshelled or raw shelled peanuts can be bought from dealers and roasted in the oven at home, or peanuts that have been roasted can be obtained. When roasting peanuts in the oven care should be taken to prevent their burning. The nuts should be stirred from time to time in order to get a uniform roast. Greater care is necessary in roasting shelled than unshelled nuts, as shelled nuts are more easily scorched. By examining the peanuts from time to time during the process the desired degree of roasting can be obtained.

When unshelled peanuts are used they should be roasted in the shell and cooled. After being cooled, they should be shelled and blanched. The blanching can be accomplished by rubbing the meats over a wire-bottom screen. This rubbing removes the skins and loosens the germs. If the screen has holes of the proper size the germs can be sifted out. The meats can be readily cleaned by being poured from one vessel to another in the open, where the wind will blow out the skins, after which they should be hand-picked.

When the meats have been cleaned they are ready for grinding. Salt may be added before or after grinding. A good type of meat grinder is satisfactory for grinding the peanut meats provided the burs are not worn. The finest burs should be used, and the machine should be set to grind the meats as fine as possible. If the butter is not fine enough after being run through the machine once, it should be put through again. When salt is not added to the nuts before they are ground it is advisable to add it to the paste before the second grinding

In order to be sure of a good grade of peanut butter it is best to make it often rather than to make a supply which will last for several months. When made at home the peanut butter actually costs much less than when bought in stores; in fact, it should not exceed 15 or 20 cents a pound, a very low price for a product of such high food value.

FOOD VALUE AND WAYS OF USING PEANUT BUTTER

Like all nuts the peanut is rich in fat, and like all legumes it is rich in protein. Moreover, the quality of the peanut protein is superior and supplements the protein of wheat in making the peanut-butter sandwich, for example, a particularly nutritious combination, as well as a happy blend of flavors. The peanut has other food values besides fat and protein. It is a good source of phosphorus and a fair source of iron, and it is rich in vitamin B.

Peanut butter is a very concentrated food, however, and therefore is not only more palatable but more easily digested if the texture is changed by combining it with other foods. Though its most common use is in sandwich fillings, it gives good flavor to soups, stuffings, and sauces for creamed and scalloped dishes. It is used in omelets, salads, breads, cakes, and frostings. The following recipes show the wide range of uses of peanut butter.

PEANUT BUTTER SANDWICHES AND CANAPÉS

Between slices of bread, or on crackers or rounds of toast, peanut butter alone or in any of the following mixtures makes good sandwiches or canapés:

Stir into the peanut butter a little cold milk or cream, to make a smooth, creamy paste. After spreading, cover with a layer of tart jelly. A sandwich with this filling is especially good if toasted.

Blend thoroughly ½ cup of peanut butter, ⅓ cup of salad dressing, and ¼ cup of tart chili sauce.

Blend ½ cup of peanut butter, ½ cup of cream cheese, 2 tablespoons of cream, and dashes of tabasco sauce and salt to taste.

Blend ½ cup of peanut butter with the mashed yolks of 6 hard-cooked eggs, ½ cup of mayonnaise, 1 to 1½ tablespoons of lemon juice, ¼ teaspoon of salt, and a few dashes of tabasco sauce. Use with a thin slice of Bermuda or Spanish onion in the sandwich or on the canapé.

Add to any of these mixtures, after spreading on the bread or crackers, a layer of cream cheese, softened with a little cream. Top each canapé with a thin slice of stuffed olive.

PEANUT BUTTER IN SALADS

Hard cook 6 eggs, remove the shell, and cut in half. Mash the yolks and blend with ½ cup of peanut butter, ½ cup of mayonnaise, 1 to 1½ tablespoons of lemon juice, ¼ teaspoon of salt, and a few dashes of tabasco sauce. Stuff the egg whites with this mixture and serve on a bed of cress, endive, or shredded cabbage, with either French or mayonnaise dressing.

Stuff cooked prunes, apricot halves, or other fruits with peanut butter and press together to form balls. Serve on crisp lettuce with any desired dressing.

Mix ½ cup of peanut butter, 2 tablespoons of cream, ½ cup of finely cut celery, and salt to taste. Form into balls and roll in finely cut raisins. Serve on a mixture of crisp greens with a French dressing.

CREAM OF PEANUT BUTTER SOUP

1 quart milk
2 slices onion
2 tablespoons flour
½ cup peanut butter
½ to ¾ teaspoon salt
Tabasco sauce
Parsley

Heat 3½ cups of the milk in a double boiler with the onion. Blend the flour and the remaining cold milk; add to the hot milk, cook, and stir until thickened. Mix the peanut butter with some of the hot sauce and add to the remainder in the double boiler. Season to taste with salt and a few drops of tabasco sauce. Remove the onion before serving, and stir in the finely chopped parsley.

PEANUT BUTTER AND TOMATO SOUP

1 no. 3 can tomatoes
½ teaspoon salt
¼ cup water
1 tablespoon flour
½ cup peanut butter

Simmer the tomatoes for 5 minutes, then press through a sieve to remove the seeds. Mix some of the hot tomato juice with the peanut butter until smooth. Blend the flour and water and salt. Add both mixtures to the remaining tomato juice. Boil gently for about 2 minutes, stirring constantly.

PEANUT BUTTER SAUCE

2 cups milk
½ cup peanut butter
¼ teaspoon salt
Sour pickle or relish, if desired

Heat the milk in a double boiler. Mix a little hot milk with the peanut butter, gradually add the remainder of the milk, stir until thoroughly blended, and cook in a double boiler until thickened. Add the salt and season to taste, with finely chopped pickle or relish. Use as the sauce for making scalloped or creamed rice, macaroni, potatoes, or other vegetables.

SCALLOPED ONIONS WITH PEANUT BUTTER

8 to 10 medium-sized onions, cooked
1½ cups peanut-butter sauce
1 cup buttered crumbs

Place a layer of the sliced cooked onions in a greased baking dish, cover with the peanut butter sauce, and repeat until all the onions and sauce are used. Cover the top with buttered crumbs and bake in a moderate oven for about 20 minutes, or until the crumbs are golden brown. Serve from the baking dish. Cabbage, cauliflower, or other vegetables may be used in the same way.

PEANUT BUTTER OMELET

4 eggs
4 tablespoons milk
4 tablespoons peanut butter
½ teaspoon salt
1 tablespoon butter or other fat
Parsley

Separate the eggs and beat the yolks until thick. Add the milk, peanut butter, and salt, and beat again. Fold this mixture into the stiffly beaten egg whites. Melt the butter or other fat in a frying pan and pour in the mixture. As soon as the omelet browns slightly on the bottom, place it in a moderate oven (350° F.) and bake for about 10 minutes. Crease the omelet through the center, fold it over, roll it onto a hot platter, sprinkle with chopped parsley, and serve at once.

PEANUT BUTTER BISCUIT

2 cups sifted flour
¾ teaspoon salt
4 teaspoons baking powder
4 tablespoons peanut butter
2 tablespoons fat
Milk

Sift the dry ingredients, and rub the peanut butter and fat into the flour with the tips of the fingers. Make a well in this dry mixture and, stirring from the center, slowly add enough milk to make a soft dough. Knead slightly, pat to about one-half-inch thickness on a lightly floured board, and cut in rounds. Bake in a hot oven (400° F.) for about 15 minutes, or until lightly browned.

PEANUT BUTTER DROP COOKIES

½ cup peanut butter
½ cup sugar
1 egg
1 cup sifted flour
2 teaspoons baking powder
¼ teaspoon salt
½ cup milk

Mix the peanut butter, sugar, and beaten egg. Sift together the dry ingredients and add alternately with the milk to the first mixture. Drop by teaspoonfuls onto a greased baking sheet about an inch apart. Bake in a moderate oven (350° F.) about 15 minutes, or until lightly browned.

PEANUT BUTTER CUP CAKES

½ cup butter or other fat
½ cup peanut butter
1 cup sugar
2 eggs
3 cups sifted soft-wheat flour
4 teaspoons baking powder
½ teaspoon salt
1 cup milk
1 teaspoon vanilla

Cream together the fat, peanut butter, and sugar. Add the beaten eggs and the sifted dry ingredients alternately with the milk. Add the vanilla. Bake in greased muffin tins in a moderate oven (350° F.) for about 20 minutes.

PEANUT BUTTER FROSTING

1 cup sugar
4 tablespoons cold water
1 egg white
¼ teaspoon salt
2 tablespoons peanut butter

Put the sugar, water, and unbeaten egg white in the upper part of a double boiler, and have the water in the lower part boiling. Commence beating the mixture with a Dover egg beater at once and beat constantly while it cooks for about 10 minutes, or until it holds its shape well when dropped from the beater. Add the peanut butter and beat again until the frosting thickens. Remove from the fire and continue beating until it again holds its shape when dropped from the beater. Cool the cake thoroughly before spreading with this frosting.

ORGANIZATION OF THE UNITED STATES DEPARTMENT OF AGRICULTURE WHEN THIS PUBLICATION WAS LAST PRINTED

Secretary of Agriculture	HENRY A. WALLACE.
Under Secretary	REXFORD G. TUGWELL.
Assistant Secretary	M. L. WILSON.
Director of Extension Work	C. W. WARBURTON.
Director of Personnel	W. W. STOCKBERGER.
Director of Information	M. S. EISENHOWER.
Director of Finance	W. A. JUMP.
Solicitor	MASTIN G. WHITE.
Agricultural Adjustment Administration	CHESTER C. DAVIS, *Administrator.*
Bureau of Agricultural Economics	A. G. BLACK, *Chief.*
Bureau of Agricultural Engineering	S. H. MCCRORY, *Chief.*
Bureau of Animal Industry	JOHN R. MOHLER, *Chief.*
Bureau of Biological Survey	IRA N. GABRIELSON, *Chief.*
Bureau of Chemistry and Soils	H. G. KNIGHT, *Chief.*
Bureau of Dairy Industry	O. E. REED, *Chief.*
Bureau of Entomology and Plant Quarantine	LEE A. STRONG, *Chief.*
Office of Experiment Stations	JAMES T. JARDINE, *Chief.*
Food and Drug Administration	WALTER G. CAMPBELL, *Chief.*
Forest Service	FERDINAND A. SILCOX, *Chief.*
Grain Futures Administration	J. W. T. DUVEL, *Chief.*
Bureau of Home Economics	LOUISE STANLEY, *Chief.*
Library	CLARIBEL R. BARNETT, *Librarian.*
Bureau of Plant Industry	FREDERICK D. RICHEY, *Chief.*
Bureau of Public Roads	THOMAS H. MACDONALD, *Chief*
Soil Conservation Service	H. H. BENNETT, *Chief.*
Weather Bureau	WILLIS R. GREGG, *Chief.*

U. S. GOVERNMENT PRINTING OFFICE: 1936

For sale by the Superintendent of Documents, Washington, D. C. - - - - - Price 5 cents